MONITORING POPULATIONS OF *SHOSHONEA PULVINATA* IN THE PRYOR AND BEARTOOTH MOUNTAINS, CARBON COUNTY, MONTANA

1991-93 Baseline Report

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INTRODUCTION

Passage of the Federal Endangered Species Act of 1973 and subsequent recognition of the value of conserving biotic diversity (Wilson 1988) have resulted in many government agencies becoming active in species conservation. Surveys to determine the location and size of populations of rare species are being conducted on public lands throughout the west. These surveys are necessary in any species conservation program; however, knowing the location and size of populations at any one point in time is only the first step in a long-term protection strategy. (Sutter 1986). Understanding the population dynamics of long-lived perennials is especially difficult because noticeable changes usually occur slowly, and important growth-limiting population-level events, such as bouts of recruitment or catastrophic mortality may occur only at infrequent intervals (Braughman and Murphy 1990). Thus, long-term monitoring of growth, fecundity, recruitment and mortality is essential for understanding the condition and trends of plant populations, particularly long-lived, slow-growing species.

(Shoshonea pulvinata Evert & Constance is a long-lived, mat-forming perennial in the Carrot Family (Apiaceae). This recently described species (Evert and Constance 1982) comprises a monotypic genus endemic to the Beartooth and Pryor mountain ranges of Carbon County, Montana and the Absaroka and Owl Creek ranges of Park and Fremont counties, Wyoming (Lesica and Shelly 1988). In Montana, Shoshonea pulvinata is generally restricted to shallow, calcareous soils of exposed limestone outcrops, rims, ridgetops and talus slopes at 6,800-7,800 ft (Lesica and Shelly 1988). In Montana, there are no apparent, immediate threats to populations of S. pulvinata. However, the species is threatened in the Beartooth Mountains by potential mining or oil and gas development and, in the Pryor Mountains, by grazing of wild horses and/or bighorn sheep. The species is ranked as G2G3/S1 (globally threatened, state endangered) by the Montana Natural Heritage Program and is considered sensitive in Montana (Lesica and Shelly 1991). Shoshonea pulvinata is listed as sensitive by Region One of the U.S. Forest Service (Lesica and Shelly 1991) and is a candidate for listing as a threatened or endangered species by the U.S. Fish and Wildlife Service (USDI-FWS 1990).

The purpose of this study is to learn details of the life history of Shoshonea pulvinata by following mapped individuals for many consecutive years. In addition, results of the monitoring can be used to detect overall population trends at these sites. Permanent monitoring transects were established at three sites in 1991 (Lesica and Achuff 1991). Here I report the results of the first three years of the study.

METHODS

Study Sites

Locations for the transects are provided in Lesica and Achuff (1991). The Mystery Ridge and Mystery Road sites are in the Pryor Mountains, while the Grove Creek site is on the east slopes of the Beartooth Mountains.

Grove Creek

The transect is on a narrow portion of the ridge ca. 100 yds west of the highest point of the ridge in Section 26. The two ends of the transect are marked by reinforcing bar pounded into the ground and painted red on top.

Line Bearing: start to end 353°

Line Length: 10 meters

Instructions: start at south end of transect; read west side of transect line.

Mystery Cave Ridge

The transect is on the west edge of the ridge in an area where it is relatively broad and open. Both ends of the transect are marked by reinforcing bar pounded into the ground and painted red on top.

Line Bearing: Not recorded

Line Length: 10.15 meters

Instructions: Start at north end of transect; read the west (downhill) side of the transect.

Mystery Cave Road

The transect is in open Douglas fir forest on the west side of the ridge. Both ends of the transect are marked by reinforcing bar pounded into the ground and painted red on top.

Line Bearing: Not recorded

Line Length: 12 meters

Instructions: Start at north end of transect; read west (downhill) side of transect line.

Field Procedures

At each site place the end ring of the meter-tape over the start pin and stretch the tape to the end pin, making sure that

the tape is taut. Using a meter-stick and the meter-tape, record the coordinates (in centimeters) for the center of each plant that occurs along the line and within 50 cm of the line on the west side. After the coordinates of each plant have been recorded, its size is estimated using a 50 cm X 50 cm sheet of clear plexiglass marked into a grid of squares that are 4 cm X 4 cm each. Place this grid on top of the shoshonea cushion in a random orientation and count the number of 1/4-squares that are filled by green vegetation (Fig. 3). Many larger plants have died out in the center; this dead region is not counted. Finally, for each plant, count the number of inflorescences. Repeat this procedure for every shoshonea plant in the 50-cm wide belt transect defined by the tape.

Data Reduction

In each transect, each Shoshonea pulvinata plant is assigned a unique alpha-numeric code that identifies it. If the plant occurs in the first meter of the belt transect, it is given the code "1" followed by a letter assigned in order. In 1991 there were six plants recorded in the first 1 meter of the Grove Creek transect. We have assigned these six plants the following codes 1a, 1b, 1c, 1d, 1e and 1f (Appendix A). These unique codes remain assigned to the plant at that location for the duration of the study. If a new plant appears in the first meter of this belt transect in subsequent years, it will be assigned the code 1g etc. Assigning a unique alpha-numeric code to each plant allows us to easily follow the fate of individuals during the coarse of the study.

For each plant, count the number of 1/4-squares and multiply the total by 4. This gives the area of the foliage in square-centimeters. Each plant's size and reproductive status can now be summarized using the following codes:

A (area) = area of vegetation in square-cm

I (inflorescences) = number of inflorescences

Thus, a plants with an area of 6 1/4-squares and 3 inflorescences is coded, A24-I3.

Statistical Analysis

For the purpose of analysis, each plant is treated as an independent observation. For all plants present throughout the study, plant size in 1991 was compared to 1993 to obtain an estimate of population vigor. I compared plants at the two times using a paired-samples t-test and the more conservative, non-parametric Wilcoxon's sign-rank test. These tests help to determine the significance of the cumulative size decreases and increases at each site.

RESULTS

The size of sample populations has been stable at Grove Creek and Mystery Road and declined appreciably at Mystery Ridge in 1991-92 but was stable in 1992-93 (Table 1). The proportion of reproductive plants was lowest at all sites in 1992 and similar in 1991 and 1993 (Table 1). Mortality and recruitment were generally low at all sites through the period except for high recruitment at Grove Creek in 1991-92 and high mortality at Mystery Ridge in 1991-92.

Between 1991 and 1993 at Grove Creek, 17 plants stayed the same size, 23 became larger, and 10 became smaller; the difference between the number of plants becoming larger and smaller was not significant (t=0.0, p=1.00; Wilcoxon, p=0.32). At Mystery Ridge 4 plants stayed the same, 4 plants became smaller, and 11 plants became larger; the difference was not significant (t=0.88, p=0.39; Wilcoxon, p=0.36). At Mystery Road 9 plants stayed the same, 16 plants became smaller, and 21 plants became larger; the difference was not significant (t=1.19, p=0.24; Wilcoxon, p=0.61).

DISCUSSION

Results from the first three years of the study suggest that the three populations are stable. Mortality and recruitment are both generally low, and the number and size of growth increases are similar to decreases.

The cushion-plant growth form and the very low mortality rate among adults indicates that Shoshonea pulvinata is a long-lived perennial. Any important long-term trends will be difficult to detect over a short time span. At this time there is no reason to believe that S. pulvinata populations are not healthy and stable. Three-year baseline data has been collected, but periodic data over at least the next decade will be necessary to detect long-term trends.

LITERATURE CITED

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Table 1. Summary statistics for Shoshonea pulvinata at three monitoring sites in 1991-92. Reproductive rate is the number of plants producing inflorescences/number of mature plants. Mortality rate is number of dead plants in year t/number of plants in year t-1. Recruitment rate is the number of new plants in year t/number of plants in year t-1.

	Grove Creek			Mystery Ridge			Mystery Road		
	1991	1992	1993	1991	1992	1993	1991	1992	1993
Total plants	57	68	66	32	23	22	50	47	47
Mature plants	28	26	29	31	19	19	44	38	38
Reproductive plants	16	11	15	21	12	16	30	14	30
Reproductive rate	57%	42%	52%	71%	65%	84%	68%	37%	79%
Mortality	--	3	7	--	10	2	--	4	1
Mortality rate	--	5%	10%	--	30%	9%	--	8%	2%
Recruitment	--	14	5	--	1	1	--	1	1
Recruitment rate	--	25%	7%	--	3%	4%	--	2%	2%

Appendix A. Scores for vegetation area (A, cm^2) and number of inflorescences (I) for plants of Shoshonea pulvinata at three sites.

	Grove Creek		
	1991	1992	1993
1a	A144-I0	A128-I0	A116-I0
b	A4-I0	A4-I0	A4-I0
c	A16-I0	A12-I0	A16-I0
d	A8-I0	A8-I0	A8-I0
e	A4-I0	A4-I0	A4-I0
f	A16-I0	A16-I0	A16-I0
g	--	A4-I0	A4-I0
h	--	A4-I0	--
2a	A4-I0	A4-I0	A4-I0
b	A4-I0	A4-I0	--
c	A4-I0	A4-I0	A4-I0
d	A4-I0	A4-I0	A4-I0
e	A228-I6	A240-I1	A208-I0
f	A4-I0	A4-I0	A4-I0
g	A40-I5	A44-I0	A48-I2
h	A28-I2	A28-I0	A36-I0
i	A16-I1	A16-I0	A16-I0
j	A4-I0	A8-I0	A8-I0
k	A4-I0	A4-I0	A4-I1
l	--	A4-I0	--
m	--	A4-I0	A4-I1
3a	A4-I0	A4-I0	A8-I0
b	A20-I0	A28-I0	A24-I0
c	A36-I3	A40-I2	A28-I1
d	A4-I0	A8-I0	A16-I0
4a	A8-I0	A4-I0	A4-I0
b	A4-I0	--	--
c	A4-I0	--	--
d	A4-I0	A8-I0	A8-I1
e	A20-I1	A16-I0	A12-I0
f	A4-I0	A4-I0	--
g	A4-I0	--	--
h	A4-I0	A4-I0	--
i	A104-I2	A108-I1	A112-I7
j	A4-I0	A4-I0	A4-I0
k	--	A4-I0	A8-I0
l	--	A4-I0	A4-I0
m	--	A4-I0	A4-I0
n	--	A4-I0	A4-I0
o	--	A4-I0	A4-I0
p	--	A4-I0	--
q	--	A4-I0	--
r	--	--	A4-I0
5a	A40-I1	A76-I4	A64-I0
b	A64-I7	A64-I3	A60-I7
c	A8-I0	A12-I0	A12-I0
6a	A116-I11	A108-I3	A120-I11

b	A68-I12	A60-I3	A56-I7
c	A16-I0	A16-I2	A20-I3
d	A80-I5	A84-I2	A88-I4
e	A108-I7	A112-I1	A112-I4
f	A4-I0	A4-I0	A8-I0
g	A4-I0	A4-I0	A4-I0
h	A4-I0	A8-I0	A12-I0
i	A4-I0	A4-I0	A4-I0
j	--	A4-I0	A4-I0
k	--	--	A4-I0
l	--	--	A4-I0
7a	A24-I0	A28-I0	A20-I0
b	A12-I0	A12-I0	A12-I0
c	A16-I0	A16-I0	A20-I0
8a	A112-I0	A120-I0	A120-I0
b	A116-I4	A132-I0	A100-I10
9a	A52-I0	A60-I0	A52-I5
b	A20-I0	A28-I0	A24-I0
c	A16-I0	A16-I0	A20-I0
d	--	A4-I0	A4-I0
10a	A532-I27	A500-I15	A492-29
b	A4-I0	A4-I0	A8-I0
c	A16-I3	A20-I0	A20-I0
d	A4-I0	A4-I0	A8-I0
e	A4-I0	A4-I0	A4-I0
f	A4-I0	A4-I0	A4-I0
g	--	A4-I0	A4-I0
h	--	--	A4-I0
i	--	--	A4-I0

Mystery Cave Ridge

	1991	1992	1993
1a	A116-I20	A108-I6	A128-I22
b	A196-I12	A220-I0	A224-I15
c	A348-I24	A352-I4	A348-23
2a	A20-I0	--	--
b	A244-I43	A244-I26	A244-I39
c,d	A488-I27	A520-I9	A524-I50
e	A16-I1	--	--
f	A44-I31	A48-I3	A36-I11
3a	A80-I20	A84-I15	--
b	A16-I4	--	--
c	--	A4-I0	--
4a	A16-I4	--	--
b	A28-I9	--	--
5a	A16-I5	--	--
b	A16-I3	--	--
c	A14-I0	--	--
d	A4-I0	--	--
e	--	--	A4-I0
6a	A56-I0	A52-I5	A60-I1
b	A64-I11	A84-I2	A72-I4

c	A28-I0	A28-I0	A20-I3
d	A16-I0	--	--
7a	A16-I0	A12-I0	A16-I0
b	A32-I2	A44-I0	A44-I3
c	A16-I0	A24-I0	A20-I0
d	A24-I0	A32-I0	A24-I0
8a	A128-I23	A120-I19	A148-I38
b	A88-I11	A88-I9	A96-I12
9a	A16-I0	A8-I0	A8-I0
b	A16-I0	A4-I0	A4-I0
c	A160-I34	A204-I32	A192-I59
d	A48-I11	A56-I8	A56-I7
10a	A236-I69	A188-I21	A192-I51
11a	A32-I2	A32-I0	A36-I1

Mystery Cave Road

	1991	1992	1993
3a	A48-I2	A52-I0	A36-I4
b	A76-I6	A44-I3	A48-I4
c	A48-I1	A44-I0	A28-I6
d	A20-I2	A32-I0	A32-I8
e	A16-I0	--	--
f	A52-I1	A76-I0	A68-I3
g	A24-I1	A16-I0	A26-I1
h	A16-I1	A16-I0	A20-I1
i	A24-I0	A24-I0	A24-I0
j	A16-I0	A8-I0	A8-I1
k	A16-I1	A8-I0	A12-I1
l	A4-I0	--	--
m	A32-I0	A24-I0	A32-I0
n	A24-I2	A32-I0	A36-I3
o	A56-I4	A16-I0	A28-I1
p	A16-I1	A8-I0	A16-I1
q	not in		
4a	A52-I0	A40-I0	A52-I0
b	A20-I2	A16-I0	A20-I2
c	A16-I0	--	--
d	A40-I3	A48-I0	A44-I0
e	A16-I0	--	--
f	A24-I5	A32-I0	A28-I1
g	A64-I1	A36-I1	A24-I1
h	--	--	A4-I0
5a	A56-I4	A68-I1	A60-I8
b	A60-I0	A60-I2	A68-I4
c	A96-I1	A96-I0	A96-I11
d	A132-I20	A140-I8	A140-I16
6a	A80-I7	A84-I4	A72-I3
7a	A24-I2	A28-I1	A28-I1
b	A24-I2	A40-I2	A32-I1
8a	A80-I11	A96-I11	A88-I14
b	A36-I5	A44-I3	A40-I1
c	A64-I12	A56-I3	A56-I1

d	A20-I0	A24-I0	A24-I0
e	A16-I0	A24-I1	A32-I2
11a	A20-I0	A20-I0	A20-I0
b	A40-I2	A44-I0	A28-I9
c	A24-I1	A28-I0	A32-I1
d	A36-I1	A32-I0	A40-I0
e	A16-I0	A8-I0	A8-I0
12a	A64-I4	A64-I0	A24-I0
b	A64-I0	A48-I0	A48-I4
c	A48-I1	A48-I3	A44-I5
d	A24-I0	A16-I1	A20-I0
e	A44-I3	A32-I0	A36-I10
f	A4-I0	A4-I0	A4-I0
g	A4-I0	A4-I0	A4-I0
h	A4-I0	A14-I0	A8-I0
i	A4-I0	A8-I0	A8-I0
j	A4-I0	A12-I0	A12-I0
k	--	A4-I0	--

SHOSHONEA MONITORING FORM

Date 18 June 93 Site Grove Creek

Recorder(s) Lenca, Heidel Page No. 1

ID = alpha numeric code; Tape = position on transect tape; Stick = distance off of baseline; Infl. = No. of inflorescences; 1/4-squares = No. of 1/4 squares filled by vegetation; Total = total 1/4-squares.

	ID	Tape	Stick	Infl.	1/4-squares	Total	Comments
1.	A	0	32	0		29	
	B	0	23	0		1	3 stems
	C	3	41	0		4	
	D	15	9	0		2	
	E	83	22	0		1	3 stems
	F	92	29	0		4	
	G	11	29	0		1	1 stem
2.	A	110	43	0		1	
	C	112	49	0		1	1 stem
	D	115	44	0		1	
	E	115	33	0		52	
	F	131	34	0		1	
	G	139	30	2		12	
	H	143	22	0		9	
	I	151	28	0		4	
	J	186	37	0		2	
	K	190	40	0		1	
	M	138	22	0		1	
3.	A	207	33	0		2	
	B	248	25	0		6	
	C	300	35	1		7	
	D	300	21	0		4	
	E	220	50	0		4	mixed w/ Anar
	F	272	47	0		14	
4.	A	305	38	0		1	3 stems
	D	335	37	1		2	
	E	341	24	0		3	
	I	380	33	7		28	
	J	388	28	0		1	
	K	337	35	0		2	
	L	342	38	0		1	

SHOSHONEA MONITORING FORM

Date 18 June 93 Site Grove Creek

Recorder(s) _____ Page No. 2

ID = alpha numeric code; Tape = position on transect tape; Stick = distance off of baseline; Infl. = No. of inflorescences; 1/4-squares = No. of 1/4 squares filled by vegetation; Total = total 1/4-squares.

	ID	Tape	Stick	Infl.	1/4-squares	Total	Comments
4.	M	343	39	0		1	
	N	343	19	0		1	
	O	347	23	0		1	
	R	345	21	0		1	
5.	A	435	40	0		16	Potfru in center
	B	457	8	7		15	
	C	491	33	0		3	
6.	A	501	30	11		30	
	B	518	26	7		14	dead center
	C	527	23	3		5	
	D	532	17	4		22	
	E	539	46	4		28	
	F	559	39	0		2	
	G	567	7	0		1	1 stem
	H	568	42	0		3	
	I	585	31	0		1	
	J	553	34	0		1	1 stem
	K	549	43	0		1	
	L	596	45	0		1	w/carex
7.	A	616	6	0		5	
	B	625	0	0		3	
	C	637	21	0		5	
8.	A	775	26	1		30	eroded on East
	B	780	38	10		25	
9.	A	820	21	5		13	
	B	846	21	0		6	
	C	854	11	0		5	
	D	818	4	0		1	
10.	A	942	19	29		123	
	B	960	17	0		2	
	C	974	30	0		5	

SHOSHONEA MONITORING FORM

Date 18 June 93 Site Grove Creek

Recorder(s) Lesica Heidel Page No. 3

ID = alpha numeric code; Tape = position on transect tape; Stick = distance off of baseline; Infl. = No. of inflorescences; 1/4-squares = No. of 1/4 squares filled by vegetation; Total = total 1/4-squares.

	ID	Tape	Stick	Infl.	1/4-squares	Total	Comments
10	D	974	44	0		2	
	E	985	31	0		1	
	F	993	38	0		1	
	G	960	50	0		1	1 stem
	H	958	13	0		1	1 stem
	I	947	5	0		1	1 stem

SHOSHONEA MONITORING FORM

Date 6/17 '23 Site Mustang Cave Ridge

Recorder(s) BH Page No. 1

ID = alpha numeric code; Tape = position on transect tape; Stick = distance off of baseline; Infl. = No. of inflorescences; 1/4-squares = No. of 1/4 squares filled by vegetation; Total = total 1/4-squares.

	ID	Tape	Stick	Infl.	1/4-squares	Total	Comments
probably not counted in 92 1.	?	1	36	1	3, 4, 1	8	
	A	15	11	22	2, 2, 4, 4, 2, 1, 4, 3, 3, 2, 3, 2	32	
	B	27	22	15	2, 4, 2, 1, 4, 4, 4, 2, 2, 4, 4, 4, 3,	56	
		~	~	~	2, 4, 4, 2, 2, 1, 1	-	~
	C	75	26	23	39 1, 1, 3, 4, 4, 3, 3, 4, 4, 4, 4, 2, 4,	87	starting to break off
		~	~	~	23 2, 3, 2, 1, 2, 1, 3, 4, 2, 1, 2,	~	
		~	~	~	25 2, 1, [illegible]	~	
2	B	103	34	39	31 2 3 2 4 4 1 1 4 3 4 3	61	
		~	~	~	27 1 2 3 4 3 4 1 [illegible]	~	
		~	~	~	3 1, 2	~	
	C	105	15	50	26 1 2 1 2 4 4 3 2 2 1 4	131	[illegible]
	and	~	~	~	33 4, 4, 3, 1, 4, 4, 4, 1, [illegible]	~	
	D	~	~	~	37 4, 3, 2, 4, 4, 4, 4, 1, 3, 4, 4	~	
		~	~	~	33 4, 4, 4, 4, 4, 4, 3, 1, 1, 2, 2,	~	
		~	~	~	2	~	
	F	180	44	11	2, 1, 4, 1, 1	9	
5	OUT?	463	49	2	1, 2, 2	5	
	OUT	475	51	1	1, 1, 1, 1, 2	6	
	6A	502	36	1	1, 1, 1, 2, 3, 1, 1, 4, 1	15	
	5E	499	47	-	1	1	
6	B	535	30	4	1, 3, 3, 2, 1, 3, 3, 1, 1	18	Was part dead
	C	536	50	3	2, 2, [illegible]	5	
7	A	614	39	-	4	4	
	B	637	27	3	3 3 1 3, 1	11	
	C	645	19	-	2, 1, 2	5	
	D	651	30	-	1, 2, 3	6	
8	A	724	19	38	2 4 3 1 2 4 2 1 2 4 1	37	
		[illegible]	~	~	2, 4, 1, 1 2, 1	~	
	B	798	5	12	1, 2, 2 3 3 1 4 2 2 3 1	24	
9	A	802	18	-	2	2	

SHOSHONEA MONITORING FORM

Date 6/17/93 Site [illegible] Ridge

Recorder(s) BH Page No. 2

ID = alpha numeric code; Tape = position on transect tape; Stick = distance off of baseline; Infl. = No. of inflorescences; 1/4-squares = No. of 1/4 squares filled by vegetation; Total = total 1/4-squares.

	ID	Tape	Stick	Infl.	1/4-squares	Total	Comments
9	B	825	22	–	1	1	
	C	847	26	59	2, 2, 1, 3, 2, 4, 4, 3, 3, 2,	48	
		~	~	~	2, 2, 3, 4, 3, 2, 2, 2, 1	~	
	D	893	18	7	1, 3, 2, 3, 2, 2, 1	14	
10	A	910	18	51	1, 2, 3, 2, 1, 1, 3, 2, 1, 4,	48	dead center
		~	~	~	1, 2, 2, 1, 4, 3, 3, 3, 1, 3,	~	
		~	~	~	1, 2	~	
11	A	1013	~~45~~ 50	1	2, 2, 3, 2	9	[illegible] on center

SHOSHONEA MONITORING FORM

Date 6/17/93 Site Mystery Cave Road

Recorder(s) BH, Lesica Page No. 1

ID = alpha numeric code; Tape = position on transect tape; Stick = distance off of baseline; Infl. = No. of inflorescences; 1/4-squares = No. of 1/4 squares filled by vegetation; Total = total 1/4-squares.

	ID	Tape	Stick	Infl.	1/4-squares	Total	Comments
3.	A	213	10	4	2, 1, 3, 1, 1, 1	9	hollow center
	C	219	17	6	2 1 3 1	7	breaking up
	D	220	24	8	1 3 2 1 1	8	
	B	218	33	4	1 3 1 2 4 1	12	
	H	223	5	1	4 1	5	
probably counted out in 92	?	225	45	5	2 2 4 5 3 1 2 4 2	29	
					1 2 3	—	
	G	237	0	1	2 3 2	7	
	F	235	22	3	3 1 3 2 1 2 3 1	17	[illegible]
	I	242	39	—	3 2 1	6	
	J	249	20	1	2	2	
	Q	264	7	5	1 1 1 2 3 1 1	10	
	K	266	33	1	3	3	
	M	272	49	—	1 3 3 1	8	
	N	280	39	3	2 4 1 1 1	9	
	O	290	25	1	1 1 1 4	7	little plants down hill
	P	293	7	1	4	4	
probably counted out in 92 →	?	299	49	17	4 3 4 3 2 1 3 2	22	
4.	A	300	16	—	1 3 3 1 2 2 1	13	
	?	303	0	7	3 2 2 4 1	12	
	B	308	20	2	2 3	5	
	D	319	43	—	1 2 1 2 3 1 1	11	
	H	313	34	—	1	1	seed on [illegible]
Not counted in 92	?	325	5	2	1 3 2 2 3 4 3 1 2 3 1	25	hollow center
	F	342	36	1	2 1 4	7	
	G	388	30	1	1 1 2 2	6	U-shaped
5	A	402	44	8	1 1 1 3 2 4 2 1	15	[illegible]
	B	408	27	4	2 1 4 1 4 3 3 2	17	[illegible]
	C	425	31	11	1 2 3 2 1 3 3 2 1 3 2 1	24	[illegible]
	D	445	12	16	1 2 3 3 2 4 3 3 2	35	[illegible]
					2 3 2 1 3 3 1		

used for [illegible]

SHOSHONEA MONITORING FORM

Date 6/14/93 Site Mustang Cove Road

Recorder(s) BH, Legical Page No. 2

ID = alpha numeric code; Tape = position on transect tape; Stick = distance off of baseline; Infl. = No. of inflorescences; 1/4-squares = No. of 1/4 squares filled by vegetation; Total = total 1/4-squares.

	ID	Tape	Stick	Infl.	1/4-squares	Total	Comments
6	A	678	26	3	1,1,2,3,1,3,4,1,2	18	breaking up
7	A	692	20	1	1,2,2,2	7	
8	A	702	10	14	3,4,1,2,4,3,3,2	22	
7	B	697	28	1	2,1,2,3	8	
8	B	702	30	1	2,2,2,2,1,1	10	
	C	702	16		3,1,1,3,3,2,1	14	
	D	712	28	—	2,1,3	6	
	E	759	50	2	2,1,1,3,1	8	
11	F	1011	7	10	2,3,1,5,2,1	13	
	A	1025	30	—	4,1	5	
	B	1027	37	1	3,2,1,1	7	
	C	1059	34	1	1,2,2,2	8	
	D	1093	37	—	1,3,4,1,1	10	
	E	1092	45	—	2	2	
12	A	1125	7	—	1,1,2,2	6	breaking up
	B	1134	3	4	3,2,2,4	12	
	C	1133	27	5	2,3,4,2	11	
	D	1148	8	—	1,1,1,2	5	
	F	1150	14	—	1	1	2 leaves [illegible]
	G	1147	42	—	1	1	1 stem
	E	1153	30	10	3,1,2,2,1	9	2 stems [illegible]
	H	1154	33	—	2	2	2 stems
	J	1171	49	—	3	3	
	I	1174	33	—	2	2	2 stems

all die → [illegible]